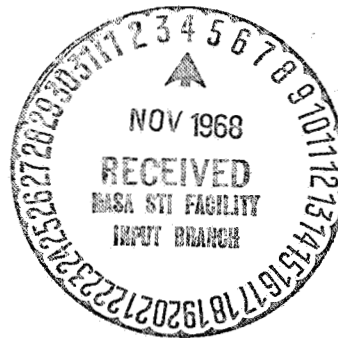
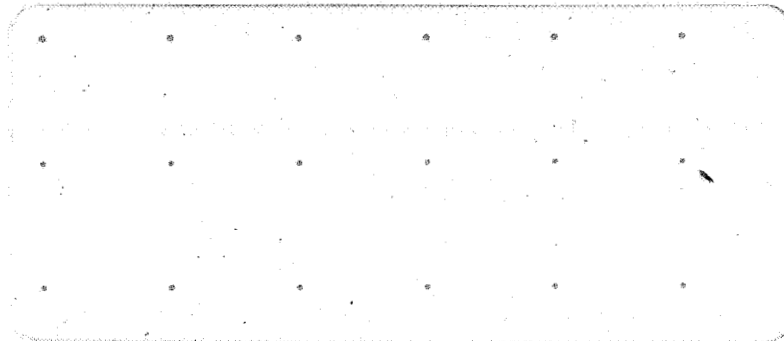


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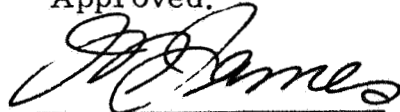
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NO. 150

MARINER C
PROJECT POLICY AND REQUIREMENTS

EPD - 150

25 February 1963

Approved:

A handwritten signature in dark ink, appearing to read "J. N. James", is written over a horizontal line.

J. N. James
Mariner Project Manager
Lunar and Planetary
Projects Office

JET PROPULSION LABORATORY
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PASADENA, CALIFORNIA

10/63

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SECTION I

PURPOSE OF THE DOCUMENT

To establish policy and place requirements on the appropriate JPL Divisions for the Mariner C Project carrying through the P-70/71/72 missions. It should be the intent of all divisions to meet all of the requirements listed herein and in the approved Project Schedules, or in any approved revision to these documents, without exception, unless specifically waived by the Project Manager. This document supplements the Mariner C Project Development Plan, and shall be the controlling document establishing requirements for design control, accomplishing hardware delivery, documentation, testing, quality assurance, scheduling, etc. Since this document contains the minimum project level requirements, it is expected that all divisions will impose within their areas of responsibility, additional requirements consistent with those of this document and funding allocations.

SECTION II

PROJECT DESCRIPTION AND GENERAL REQUIREMENTS

A. MISSION OBJECTIVES

See Section 2 of Mariner C Spacecraft Design Specification Book (SDS)-MC-2-110.

B. PROJECT PLAN

Complete Type Approval (TA) tests are to be conducted and completed no later than one month prior to the delivery of flight hardware to the Spacecraft Assembly Facility (SAF) for the P-70/71/72 missions. These equipments are then to be subjected to subsystem life-testing where applicable.

The delivery of two sets of flight equipment is to be made to SAF as indicated on the attached Project Schedule. One set of flight equipment will be assembled and one set will be carried as a spare. The assembled spacecraft and supporting spares will be committed to Proof Test Model (PTM) testing. After design qualification tests, the PTM shall be subjected to further spacecraft system life-testing.

Four sets of flight equipment and certain selected spares are to be delivered to support the P-70/71/72 missions as indicated on the attached schedule. Three spacecraft will be assembled for these missions. The three spacecraft are to be completely qualified prior to shipment to the range.

It shall be planned to launch the P-70/71/72 missions from two launch pads. There shall be a capability to launch the first two missions from separate launch pads with a minimum separation of two days. The third mission shall be launched from the same pad as the first mission. Until launch minus a few hours, a capability should exist to commit to the first launch from either space vehicle on either pad. The residual spacecraft hardware shall be operated to support space flight operations to resolve flight anomalies.

It is required that any conflicts with other Laboratory activities be brought to the attention of the Mariner Project Management.

C. EQUIPMENT DESCRIPTION AND REQUIREMENTS

1. Equipment Description

a. Spacecraft

See the SDS for description of design. The following types of spacecraft equipment are required:

- (1) Structural Test Model (STM)
- (2) Temperature Control Model (TCM)
- (3) Proof Test Model (PTM)
- (4) Type Approval Equipment (TA)
- (5) Flight Spacecraft
- (6) Spacecraft Spares

b. Operational Support Equipment (OSE)

(1) Systems Test Complex (STC): The systems test complex (STC) will be the basic test equipment unit used in tests and operations to verify the adequacy of the spacecraft design, fabrication, assembly, and flight readiness. The STC as an objective will have the capability to power, command, and monitor the performance of the spacecraft down to the provisioned spares level. Consideration shall be given to using Mariner R STC equipment where applicable.

The STC design shall be such that the possibility of damaging the spacecraft by a malfunction in the STC or operator error is highly unlikely.

(2) Launch Complex Equipment (LCE): Launch Complex Equipment (LCE) will be used to power, command, and monitor the spacecraft during all pad operations. Portions of the STC shall be capable of performing telemetry monitoring of the spacecraft during pad operation to determine flight readiness. JPL - furnished launch pad equipment, such as generators, etc., are considered

a part of the LCE set. Consideration shall be given to using Mariner R LCE equipment where applicable. The LCE design shall be such that the possibility of damaging the spacecraft by a malfunction in the LCE or operator error is highly unlikely.

The LCE shall be configured where necessary to support operations at the Explosive Safe Area and as spares in the launch area.

(3) Miscellaneous OSE: Additional OSE such as dummy loads, in-line cable adapters, hoisting fixtures, spacecraft transport dolly's, etc., are required.

c. Launch Vehicles

Three SSLV/Agena D launch vehicles are required with peculiar modifications to meet the mission requirements defined in JPL "Launch Vehicle - Spacecraft System Integration Planning Document".

d. Compatibility Verification Equipment

Normally the STC/LCE combination should be adequate to commit the spacecraft system to launch. DSIF Station 0 may be used to assure the compatibility of the spacecraft and the DSIF prior to launch. It or its equivalent must be employed in spacecraft qualification testing at SAF since all such design and flight readiness qualifications, such as J-CLOT, must be performed on the spacecraft prior to shipment to the range. Alternatively each STC can be provided with equivalent capability.

e. Space Flight Operations Facility (SFOF)

The SFOF shall be utilized to conduct the flight operations of the P-70/71/72 mission. Those portions of EPD 68, "SFOF Design Criteria" as necessary to meet the requirements of this document shall be made operational.

The DSIF shall be utilized to communicate with the Mariner C spacecraft during space flight operations. It is a requirement to implement certain redundant capabilities at the appropriate DSIF stations and in the communication nets.

Mission requirements for a dual launch must be satisfied by the SFOF and DSIF during pre-flight and flight operations for the P-70/71/72 missions. Detailed interface requirements shall be established by the Spacecraft - SFO/DSIF Integration Planning Document. Operational requirements shall be described in the Space Flight Operations Plan. For the P-70/71/72 mission, at least 24 hour/day coverage is required for the duration of the flight until approximately two weeks after satisfactory planetary data has been recovered. The P-70/71/72 mission shall time share this minimum 24 hour/day capability on a negotiated basis. There must be a capability for a considerable amount of simultaneous reception from two spacecraft throughout the flight operations. Conflicts with other projects will be negotiated.

Control of Mariner C peculiar equipment at DSIF Station and SFOF shall be handled in the same manner as OSE.

2. Spacecraft Equipment Requirements Summary

<u>Equipment</u>	<u>Quantity</u>	<u>Proj. Ref. No.</u>	<u>Utilization</u>	<u>Subsystem Testing Requirements</u>	<u>System Testing Requirements</u>
S/C Development	As Budgeted	None	Breadboards, Protos, etc.	Design concept documentation & inter subsystem compatibility	None
Structural Test S/C	1	STM	Div. 35 Structural Design	Division 35, 34	Division 35
Temperature Control S/C	1	TCM	Div. 35 Temp. Control Test	Division 35	Division 35
S/C Type Approval	1 set	T. A.	T. A. & Compatibility test	T. A., Subsystem Life OSE Compat.	None
Assembled Flight S/C	1	MC-1	PTM allocation	F. A.	System Design Verification & Life
Flight S/C Spares	1 set	MC-2	Spare for PTM	F. A.	None Planned
Assembled Flight S/C	1	MC-3	P-70 Mission	F. A.	System Flight Qualification @SAF, Flight Prep. @AMR
Assembled Flight S/C	1	MC-4	P-71 Mission	F. A.	System Flight Qualification @SAF, Flight Prep. @AMR
Assembled Flight S/C	1	MC-5	P-72 Mission	F. A.	System Flight Qualification @SAF, Flight Preparation @AMR

2. Spacecraft Equipment Requirements Summary (Continued)

<u>Equipment</u>	<u>Quantity</u>	<u>Proj. Ref. No.</u>	<u>Utilization</u>	<u>Subsystem Testing Requirements</u>	<u>System Testing Requirements</u>
Flight S/C Spares	1 set	MC-6	Spare for P-70/71/72 Missions	F.A.	None Planned
Flight S/C Spares	1 partial set	MC-7	Spares for P-70/71/72 Mission	F.A.	None Planned

NOTE: Approved design changes must be made in all sets of TA, PTM, Flight and spare equipment. Articles subjected to life or T.A. testing may not be used for flight.

3. OSE Equipment Requirements Summary

<u>Equipment</u>	<u>Quantity</u>	<u>Proj.Ref.No.</u>	<u>Utilization</u>	<u>Require Del. to SAF</u>
Assembled STC	1	STC-1	PTM	yes
Assembled STC	1	STC-2	Flight S/C	yes
Assembled STC	1	STC-3	Flight S/C	yes
Assembled STC	1	STC-4	Flight S/C	yes
Assembled LCE	1	LC-1	Blockhouse A	yes
Assembled LCE	1	LC-2	Blockhouse B	yes
Assembled LCE	1	LC-3	ESA and Spare	yes

NOTE: All sets of STC shall be maintained identical.

All sets of LCE shall be maintained identical.

All sets of DSIF and SFOF Mariner C Peculiars shall be maintained identical.

SECTION III

DESIGN REQUIREMENTS

A. SPACECRAFT DESIGN SPECIFICATION BOOK (SDS)

It is required that a single SDS be prepared and maintained current by all divisions through final lift-off of the P-70/71/72 mission. The Systems Division is responsible for the general preparation, integration and publishing of the information in the SDS. The SDS is to represent the culmination of the preliminary design and is to be completed at the conclusion of this design. (See attached schedule) The sections of the SDS shall be prepared as follows:

<u>Section</u>	<u>Prepared By</u>	<u>Initial Issue & Changes Approved By</u>
Introduction	Systems Division	Section 313 Chief
Mission Objectives & Design Criteria	Project Manager	Director of Projects
Design Characteristics & Restraints	S/C Project Engineer	S/C System Mgr/Section 313 Chief
Functional Specification*	Division Representative	S/C Project Engineer

* Functional specification will be listed on the freeze list after first issue and subsequently changed by ECR action only.

B. OPERATIONAL SUPPORT EQUIPMENT DESIGN SPECIFICATION BOOK (OSEDs)

It is required that an OSE Design Specification book be prepared and maintained current by all divisions through lift-off of the P-70/71/72 mission. The Systems Division is responsible for the general preparation, integration and publishing of the information in the OSEDs. The OSEDs is to include functional specifications to define the interfaces between elements of the OSE itself as well as those of the OSE/SC or OSE facility. See attached schedule for due dates. The sections of the OSEDs shall be prepared as follows:

<u>Section</u>	<u>Prepared By</u>
Introduction	Systems Division
Test Philosophy and Design Verification	Spacecraft Systems Manager
Design Characteristics and Restraints	Spacecraft Project Engineer
Functional Specification	Division Representatives

Functional specifications will be listed on the freeze list after first issue and subsequently changed by ECR action only.

C. INTERFACE CIRCUIT DATA SHEETS

To further define electrical interfaces beyond the functional specifications, interface circuit data sheets are required.

Interface Circuit Data Sheets describe, in terms familiar to the circuit designer, all spacecraft electrical interfaces and include circuits between subsystems, circuits within a subsystem whose connections are routed through the spacecraft ring harness and circuits connecting the spacecraft with the OSE. The circuit descriptions and signal characteristics documented by these interface data sheets constitute control documents defining the interfaces. The interfaces between subsystems shall be cooperatively generated between the subsystems involved. The Systems Division shall be responsible for mediating any disputes arising out of disagreements between subsystem circuit designers.

Further, the Spacecraft Project Engineer shall maintain and keep current these circuit data sheets. They shall be put on the freeze list after issue. Issue shall not be made until complete agreement as to the interfaces exists.

D. SPACECRAFT CONFIGURATION DRAWING

To define the location of all subassemblies on the spacecraft, but not necessarily to detailed dimensions, the Engineering Mechanics Division shall prepare Spacecraft - Configuration Drawings. These drawings shall be cosigned by the Spacecraft Project Engineer and placed on the freeze list at a prescribed schedule date.

E. SPACECRAFT CONTROL DRAWING

In order to control dimensions and finishes, the Engineering Mechanics Division shall prepare Configuration Control Drawings.¹ These drawings shall be cosigned by the Spacecraft Project Engineer and placed on the freeze list at a prescribed schedule date.

F. EQUIPMENT LIST

Based on the spacecraft layout, it is required that the Spacecraft Project Engineer coordinate, prepare, and submit to the Spacecraft System Manager and the Project Manager an equipment list. All subassemblies and parts shall be grouped together per the SAF delivery configuration, as recommended by the Spacecraft Project Engineer. It is assumed that as a general rule these equipment groups would also represent the configuration in which equipment would be both carried as spares and environmentally TA and TA tested. Thus Environmental TA and FA Test Specifications would be written for each of these equipment groups. Such groupings of hardware are defined as "provisioned spares".

¹NOTE: Refer to JPL Re-Order No. 62-142.

G. DESIGN CONTROL FOR SPACECRAFT AND OSE

1. Freeze List

To "freeze" the design is to bring it under ECR control. Initially, critical interfaces will be frozen and as the interfaces are better defined in detail, this detail design will be frozen. Prior to November 1, 1963, the total spacecraft design shall be frozen. Total freeze on OSE will occur prior to May 1, 1964. At this designated time it is no longer necessary to maintain a freeze list.

The freeze list shall be maintained and issued by the S/C Project Engineer and he will determine when interface documents shall be listed and at which time they will be brought under ECR control. Every document on the freeze list shall be binding on the design. When these documents are modified by ECR action, revision letters shall be shown on the freeze list.

The freeze list shall typically contain the following:

- (a) Functional Specifications
- (b) Interface Circuit Data Sheets
- (c) Spacecraft Configuration Drawings
- (d) Spacecraft Control Drawings
- (e) Cabling Harness Diagrams
- (f) General Environmental Specifications
- (g) Other general specifications influencing design

2. ECR Action

The need to made changes may result from design or hardware reviews, prototype testing, TA testing, etc.

Changes to TA, PTM, or flight spacecraft hardware; to OSE, and to associated drawing and specifications, once they fall under ECR control as defined above shall be made only after approval of a properly completed ECR. The ECR shall contain a functional description of the proposed change and

sufficient detail information so that performance, schedule, cost and effectivity implications of the proposed change can be determined. Anyone may initiate an ECR. As a part of the approval process, the appropriate division shall assign a follow-up engineer to each ECR. In cases where more than one division is affected, a separate ECR will be prepared for each division. Approval of ECR's is made by the S/C Project Engineer and requires the cognizant engineer to implement the required changes in detail and to report on the completion of all follow-up action. For example this follow-up report should certify that the authorized changes have been incorporated in all appropriate hardware and documentation. A procedure will be instituted to ensure that the ECR is complete and documented.

- a. The initiator shall be responsible for:
 - (1) Determining the requirements for the ECR.
 - (2) Evaluating to the degree possible the proposed ECR in terms of subsystem compatibility, reliability, cost and schedules prior to submission to the Spacecraft Project Engineer.
- b. The Spacecraft Project Engineer shall be responsible for:
 - (1) Reviewing the ECR and approving or disapproving after verifying the acceptability of the change to all affected subsystem groups.
 - (2) Establish with the appropriate division assignment of a follow-up engineer to implement the approved change in detail.
- c. The follow-up engineer shall be responsible for:
 - (1) Accomplishing all necessary changes to both documentation and hardware as approved in the ECR.
 - (2) Informing the Spacecraft Project Engineer of any problems encountered in accomplishing the change.

- (3) Advising the cognizant Section Chiefs of the required change.
- (4) Requesting reinspection of hardware to the change.
- (5) Accomplishing the hardware requalification as required.

d. Quality Assurance shall be responsible for verifying that adequate inspection has been conducted on all reworked hardware to the appropriate revised or supplementary documentation.

Any appeals concerning ECR approvals should be brought to the attention of the Spacecraft System Manager. The Spacecraft System Manager shall convene the Mariner Design Review Board to evaluate ECR's at his discretion.

H. DESIGN DOCUMENTATION

1. General

Design documentation includes drawings, design specifications, detail specifications, environmental test specifications, and general specifications determining design. A summary follows.

<u>Type</u>	<u>Documentation Requirements</u>
Drawings	Required on all S/C and OSE to duplicate.
Drawing Lists	Required on all S/C and OSE as above. Update and issue no less than once every month.
Design Specification	Required on all S/C. Desired on OSE.
Detail Specification	Required on S/C and OSE only where Division deems necessary to supplement drawing for fabrication.
Environmental Test Specification	Required on all S/C per equipment list.

<u>Type</u>	<u>Documentation Requirements</u>
General Specifications	Required where applicable.
Specification Lists	Required on all above specs. Update and issue no less than once every month.

A summary of the Mariner C Project Policies concerning design documentation follows and the methods of documentation and the minimum standards applied thereto shall be common to all divisions and for all flights. The design documentation shall:

- (a) Be of such format, completeness, detail, and accuracy that flight and OSE hardware can be accurately reproduced by the supplying division.
- (b) Establish an accurate record of all spacecraft hardware, and be complete and adequate for review purposes on a continuing basis. Description of the hardware "as flown" will be complete two weeks after spacecraft lift-off.
- (c) Provide inspection requirements and criteria sufficient to aid and allow the inspection of significant design details by the Quality Assurance organization.
- (d) Be complete and listed prior to delivery of flight hardware to SAF. All revisions must be incorporated and properly listed within two weeks after launch.

2. Drawings and Listing

It shall be the responsibility of the Engineering Mechanics Design Section, 356, to establish drafting standards suitable to the Projects and to provide a design, drafting, check and release service to the technical sections. They will judiciously aid and assist the technical sections in accomplishing the degree of documentation required above. Definitions of the classes of drawings, format requirements, and release procedures are described in JPL Specification 20030A. Spacecraft hardware and OSE must be inspected to good quality documentation prior to delivery to SAF.

Designs which are accomplished in-house shall result in drawings which meet the requirements of the JPL Design and Drafting Manual.

Designs which are accomplished out-of-house shall result in drawings which meet the requirements of JPL Specification 20030A. Specification 20030A permits the use of formats other than that of JPL. When a contractor is being considered for, or has already started a contract, the cognizant technical section shall enlist the support of Section 356 to evaluate the contractor's drawing standards. The Section 356 engineer will apprise the cognizant technical section chief of the suitability of the contractor's standard in meeting the established program objectives. The technical section chief may waive the requirements of 20030A, providing he deems the contractor format suitable, by written statement to the Spacecraft Systems Manager.

All drawings used in the Mariner C design will be listed on a comprehensive offset drawing list prepared by Section 356. The Spacecraft Project Engineer will provide Section 356 with an equipment list which will serve as a starting point for the drawing list. Information required by Section 356 to "prepare and maintain" the drawing list is described in JPL Specification 20030A. Each Division Project Representative is charged with the responsibility of maintaining adequate liaison with Section 356 to see that sufficient information is available to permit regular updating of the list.

The preparation of drawings must be scheduled such that at every in-process inspection point adequate assembly drawings showing every part with a parts list (in some cases photographs are acceptable for this purpose) must be available for inspection. By November 1, 1963, a total set of such drawings along with schematics and control and configuration drawings must exist and be listed.

3. Specifications and Listing

The Systems Division has the responsibility to establish specification standards and format suitable to the Projects and to provide a writing, editing, typing, release, and control service to the technical sections. It is encouraged but not required that all specifications conform to the JPL format defined in Engineering Planning Document No. 8, and each JPL prepared specification

must carry a number assigned by Section 315. For contractual purposes, the JPL Specification must be of EPD-8 quality. The objectives, content and applicability of the various types of specifications shall adhere to the statements below. Any specification may be subjected to ECR control by putting it on the freeze list.

a. Functional Specifications

The scope and purpose of the Functional Specifications are defined in the SDS Book "Introduction" (MC-1-110).

b. Design Specifications

Design Specifications shall be prepared on all spacecraft equipment subsequent to the completion of the Functional Specifications for the purpose of directing design unless specifically waived by the Spacecraft System Manager. Design Specifications shall define interface mechanizations and shall include a detailed description of equipment operation, the error allocations within the equipment, performance parameters, and quality assurance provisions required to initiate and complete a detail design for that item of equipment, whether the design is conducted within JPL or by a subcontractor. Bench performance testing may be included. These specifications shall be signed by the Spacecraft Project Engineer to assure compatibility of the technical interfaces involved. They shall, as a minimum requirement, also be signed by the cognizant engineer.

c. Detail Specifications

Detail Specifications shall be prepared concurrently with the design and development of equipment and prior to the fabrication of end item equipment where necessary to supplement drawings, for the purpose of fabrication. The Detail Specifications and associated drawings provide a complete compilation of the necessary information for fabrication and inspection. Bench performance testing may be included. These specifications shall be signed by the cognizant engineer.

d. Environmental Test Specifications

The Systems Division shall be responsible for establishing the general environmental requirements in the form of general specifications for type approval and flight acceptance testing. The divisions shall be expected to perform their testing in a manner that is consistent with the intent of these general environmental specifications and as is appropriate to each piece of hardware. For Mariner C, this specification shall be Environmental Specification 30250B, 30251B. This specification shall be under the ECR System by placement on the freeze list to assure that specification revisions are adequately noted for incorporation into the design and properly integrated into the test program, and to ensure consideration of the consequences of the revisions before making the revisions.

Environmental Type Approval and Flight Acceptance Test Specifications (they may be combined or separate), are to be prepared, as a general rule, for each equipment grouping shown on the Equipment List (see III-F). If, in special cases, any of these equipment groups must be broken for any reason for environmental testing, such exceptions will be a consequence of the proposals to do so by the respective divisions in Spacecraft Equipment Flow Plans and the subsequent approval of these plans by the Project and Spacecraft System Managers. In such cases, Environmental TA and FA Test Specifications must be prepared on each sub grouping of equipment. Test Specifications must include:

- (1) Identification of equipment configuration subjected to tests.
- (2) Environmental type approval and flight acceptance tests consistent with each step of Environmental Specification 30250B, 30251B.
- (3) Performance criteria, easily understood by test personnel, by which the acceptance or rejection of the assembly is determined under stressed environments.
- (4) Pre and Post Environmental Test performance checks where applicable.

(5) Description of Support Equipment required for test.

Bench performance testing may be included.

Each Environmental Test Specification shall be submitted to the Environment Requirements Project Representative for review well in advance of the time TA and FA Environmental Tests are to begin. Each specification must carry the signatures of the cognizant Section Chief or his designated alternate and the Environmental Requirements Project Representative.

e. Specification List

A specification offset list shall be prepared for each project. An engineer in Section 315 shall be designated to prepare and maintain this list. Sections 315 and 356 shall closely coordinate the preparation of the specification offset list and the drawing offset list. The specifications required for this project may be updated from existing specifications, if applicable, and listed on the specification offset list.

As in the case of Drawing Lists, each Division Project Representative shall make arrangements to provide updated inputs to the Specification List.

As an aid in preparing the offset lists, each division shall contribute their information via worksheets provided by Section 315.

I. L/V-S/C SYSTEM INTEGRATION DOCUMENT

Such a document is required and its preparation shall be the responsibility of the Project Representative of Section 311. Among others, it should be reviewed by the Spacecraft System Manager or his designated representative, and is an official Project requirement when signed by the Project Manager. Revisions require the same coordination and signatures.

This document shall define the project requirements and constraints placed on the launch vehicle system and shall contain as much spacecraft and launch vehicle system details as is necessary to develop and control the interface.

J. LAUNCH CONSTRAINTS PLANNING DOCUMENT

Such a document is required and its preparation shall be the responsibility of the Launch Constraints Representative. Among others, it should be reviewed by the Space Flight Operations Test Director, the Spacecraft Systems Manager, and the Project Representatives of Section 311, 312, 314, and the DSIF. The function of this document is as follows:

- (1) To describe the requirements for tracking and telemetry support in the period from launch through launch plus three hours.
- (2) To provide information which will describe the resources available to meet these requirements.
- (3) To examine all other areas such as spacecraft, range safety, launch vehicle, etc., for constraints to the design of the launch period and launch window.
- (4) To develop a launch constraints plan based on the information described in Sections 1, 2 and 3, and the characteristics of the near earth trajectories. This plan will be a project requirement when signed by the Project Manager.

This document is to be prepared early in the Project to guide other actions. These guidelines will be followed in preparing the document.

- (1) Class I coverage designation shall be used and indicates coverage which is mandatory. The lack of such coverage may justify a hold of the launch. Class II coverage designation shall be used and indicates coverage which is desirable. The lack of such coverage does not justify a hold of the launch.

- (2) Data requirements in the area of telemetry and tracking coverage shall be obtained from the following areas:

<u>Area</u>	<u>Source</u>
Launch Vehicle	Project Rep. Section 311 ¹
Spacecraft Events	SDAT Director
Orbit Determination	Project Rep. Section 312
DSIF Acquisition	Project Rep. DSIF

- (3) Information obtained from the AFMTC, the JPL NTSO Representative and others shall be used in the determination of expected AMR tracking and telemetry coverage.
- (4) Information obtained from the DSIF Project Representative, the SFO Test Director, the Trajectory Design Engineer, and others will be used to determine the expected DSIF tracking and telemetry coverage.
- (5) Appropriate maps, graphs and charts will be prepared as part of the launch operations plan. A summary plot of launch window vs launch day indicating the constraints bounds and the reasons for the bounds will be included.
- (6) Methods for improving tracking and telemetry coverage will be included.

This document will be used as a guideline to the Program Requirements Document (PRD), the Space Flight Operations Plan (SFOP), the Assembly and Operations Plan (AOP), S/C-LV integration document, the S/C-DSIF-SFOF interface document and other interface documentation.

K. SPACECRAFT-SFO/DSIF INTERFACE DOCUMENT

Such a document is required and its preparation shall be the responsibility of the SFO System Manager. Among others it should be reviewed and approved by the DSIF and Spacecraft System Managers. It is an official Project requirement when signed by the Project Manager.

¹ Requirements for tracking and telemetry coverage of the launch vehicle are imposed by the Launch Vehicle Systems Manager.

This document emphasizes the design aspects of the interface between the spacecraft and the SFO/DSIF much in the manner of the L/V-S/C integration document. It shall contain as much spacecraft and SFO/DSIF system details as necessary to control the interface of the course of events from launch through encounter.

L. DESIGN AND Q. A. REVIEWS

1. Design Review Borad

A review program shall be conducted as the spacecraft design, fabrication and testing evolves. Reviews shall be performed at discrete times as indicated on the attached schedule, but may be called by the Spacecraft System Manager as required.

A Mariner Spacecraft Review Board shall be comprised as a minimum of Spacecraft Equipment and Systems Section Chiefs (or Assistant Section Chiefs if so designated), as required, the Director of Q. A., and chaired by the Spacecraft System Manager.

Attendance of other personnel such as Project Representatives and design team members shall occur as appropriate.

The Board shall consolidate its opinions and document its findings.

2. Systems Interface and Subsystems Design Review

The cognizant technical section shall be responsible for conducting a review on its subsystem for the Board, each review to be scheduled by the Program Engineer. In addition to the concerned members of the Review Board, representatives of System Design, Component Parts Evaluation, Design Documentation, Packaging, and Cabling activities shall participate.

A series of sessions will be held to review the subsystem designs and consistency with interface design. The purpose of these reviews is to examine the compatibility and consistency of the interface designs as described by the

Interface Circuit Data Sheets and to determine the degree to which the subsystem design meets the provisions of the Design Characteristics and Restraints Documents and Functional Specifications in the SDS. To the degree possible on the dates scheduled, these reviews shall include an evaluation of detail mechanization, component application, parts quality, packaging, electronic, and mechanical design.

As a rule, Design Specifications should be submitted to the Review Board in advance of the Review as preparation.

3. Hardware Review

The Spacecraft System Manager shall conduct a Hardware Review on all flight hardware delivered to SAF, and may appoint personnel as required to assist in this function. Inspection reports, failure reports, MRB actions, documentation, and test history shall be reviewed collectively to verify that applicable tests and inspections have been performed with acceptable results, and that the equipment quality meets the required standards.

SECTION IV

QUALITY REQUIREMENTS

A. GENERAL

It shall be the responsibility of Quality Assurance organization to establish and monitor quality assurance programs for all spacecraft hardware and Operational Support Equipment. It should be clearly understood that the responsibility for quality lies clearly with the division supplying equipment and those divisions shall establish a plan, or see that their contractors establish a plan, to assure quality in spacecraft and OSE. The Quality Assurance Organization in turn shall verify the adequacy of the plans and shall perform a redundant monitoring function to provide assistance as an independent verification of assumed quality.

As a guide to establishing a plan for quality assurance activities with contractors and on-lab, JPL Specification 30274, Quality Control Requirements for Mariner Program Procurement, shall be followed whenever possible.

Until such time as the total specification can be met, each division shall see that the following sections of Specification 30274 are met by each contractor on spacecraft equipment:

- (1) 3.3 (and 6. Note) Quality Assurance Plan Submission
- (2) 3.4 Quality Assurance Plan Coverage
- (3) 4.4.8 Material Review Board
- (4) 4.4.11 Failure Reports
- (5) 4.4.12 Monthly Summary of Failure Reports
- (6) 4.4.16 In-Process Inspection
- (7) 4.4.17 Final Inspection

The remainder of the sections are to be implemented as rapidly as possible.

B. IN-PROCESS INSPECTION

It is a Project Requirement that all spacecraft hardware is to be inspected in the process of fabrication or rework, to the appropriate drawings and specifications. Refer to Specification 30274.

Spacecraft electronic hardware is subject to inspection to the following specifications with revision letter as shown unless alternate criteria have been provided to Q.A. by the supplying division. No revisions of the following documents shall be applicable to the Mariner C Project without Spacecraft Systems Manager approval.

- (1) JPL 20016C - General Specification, Workmanship Requirements for Electronic Equipment
- (2) JPL 31128 - General Specification - Mariner C Flight Equipment, Electronic Packaging
- (3) JPL 31170 - General Specification - Mariner C Flight Equipment
- (4) JPL 20060A - Process Specification, Adhesives, Coatings, and Encapsulants for Electronic Packaging
- (5) JPL 30261 - General Specification, Materials Processes and Hardware for Fabrication of Spacecraft Electronic Equipment
- (6) JPL 30262 - General Specification, Soldered Cordwood Electronic Module Fabrication
- (7) JPL 20014 - General Specification, Soldering Process
- (8) JPL 20028 - General Specification, Terminal Boards, Fabrication of
- (9) JPL 30879 - General Specification, Spacecraft Flight Equipment, Identification of Electronic Assembly Chassis
- (10) JPL 20026 - General Specification, Component, Installation of

It is desired that OSE conform to the following:

- (1) JPL 14902 - Wiring, Ground and Missile Electronic Equipment
- (2) JPL 20027 - Securing of Components
- (3) JPL 30600 - Paint Standard, NASA Ground Equipment
- (4) JPL 30602 - Engraving on Ground Equipment

C. SPACECRAFT EQUIPMENT CERTIFICATION AT SAF

All divisions shall be required to certify all hardware to the Q. A. organization prior to its acceptance at the SAF for system use. Note that this certification is to be complete by the dates indicated on the attached schedule. If a division must stagger equipment deliveries, the last delivery must occur prior to the completion date scheduled. Certification shall convey the written record that the following minimum project requirements have been met:

- (1) The FA testing was satisfactorily accomplished and the proper documentation completed.
- (2) Records exist covering in-process and final hardware inspections, or, if deviations exist, records of such deviations by MRB action.
- (3) All ECR's of record were implemented on the hardware prior to delivery.
- (4) Statement of measured results in the following areas: weights, power consumption and accumulated running time, magnetic field mapping, and radioactive source identification.
- (5) Design documentation is released.
- (6) Other special requirements, as defined by each cognizant division, have been satisfied.

An external hardware inspection will be performed prior to certification.

D. MATERIAL REVIEW BOARD

The quality control personnel shall be responsible for inspecting spacecraft hardware and accepting or rejecting it depending on its conformance to the required criteria. Discrepant hardware can be utilized without rework if a Quality Assurance engineer and the cognizant engineer can agree. In cases where they do not agree, a third party shall be called upon to constitute an MRB. This third party shall be the cognizant Section Chief or his alternate designated in writing and he shall make the decision. His decision shall be recorded in an MRB report, a copy of which is forwarded to the Spacecraft Systems Manager.

As an alternate to the above procedure on out-of-house contracts, Specification 30274 can be utilized.

E. FAILURE REPORTING

Starting with performance testing of TA, PTM, Flight, and spare spacecraft equipment, failure reports shall be prepared by all divisions including their subcontractors and vendors on all failures immediately after the failure is recognized. Failure reporting on OSE may begin after delivery to SAF.

In the case of contractors, failure reports may be summarized monthly per Specification 30274 except in the case of Environmental FA and TA testing, where individual reports are to be submitted to JPL.

Quality Assurance shall identify a coordinator for all Project failure reporting and cognizant divisions shall see that all contractors monthly summaries and individual reports are forwarded to him.

On all failures, expeditious action must be taken accomplishing, verifying, and documenting corrections.

Failure report summaries shall be compiled at no less than monthly intervals by the Quality Assurance coordinator. The Q.A. Project Representative shall report on these summaries at the Project meetings.

Quality Assurance shall prepare and make an adequate stock of failure report forms available to all divisions. The forms shall be in two parts - 1st the details of the failure and 2nd, the follow-up action taken as a consequence of the failure. Cognizant Section Chief approval is required on the form to conclude the follow-up action. At JPL, when a failure occurs, the individual observing the failure shall make and distribute copies; one to the cognizant engineer, and one to the designated Q.A. coordinator, who will make appropriate distribution.

Upon concluding follow-up action, the cognizant engineer shall send a close-out copy to the Q.A. coordinator, who will make appropriate distribution.

F. CONTROLLED PARTS

Every component part except fasteners employed for TA, PTM, flight, or spare spacecraft hardware shall be screened by test and/or inspection. After the part passes the screening test it shall be identified by serial number or tagged so that parts which have not been screened will not be incorporated in spacecraft equipment. Once screened, the marks or tags will not be removed prior to assembly. Serializing is a goal - not a requirement on Mariner C.

All electronic parts used on the spacecraft shall be selected from the following three categories in decreasing order of preference, unless individual exceptions are permitted by waiver from the spacecraft Systems Manager.

- (1) Hi-Rel rated parts, conforming to a 20,000 series detail specification.
- (2) JPL preferred rated parts listed in Specification 20061. One hundred percent screened in accordance with Procurement Specification 30270, or with Series Test Specification 30237.
- (3) Commercial grade parts screened in accordance with Specification 30237 and 30270 or equivalent as determined by the cognizant divisions in the event that Specification 20061 does not include sufficient types of parts to meet a division's requirement.

Assistance in these matters will be provided by the Component Parts Evaluation Group of Section 343 and Quality Assurance. Section 343 will provide timely reports on the status of parts used on the spacecraft to the Spacecraft System Manager based on the availability of Drawings and Parts Lists.

G. PROTECTION OF FLIGHT HARDWARE

Hardware-supplying sections shall be responsible for the exercise of proper caution during the fabrication, handling, storage, and shipping of flight hardware. These precautions shall include control of the ambient environment, provision of adequate storage containers, instruction of personnel in the moving of sensitive equipment, and compliance with the requirements for shipment to field installation.

SECTION V

SUBSYSTEM TESTING REQUIREMENTS

Each division shall be responsible for accomplishing testing of its equipment at the subsystem and Assembly¹ level and below. The project requirements shall be for environmental flight acceptance testing on all PTM flight, and spare spacecraft equipment and environmental type approval testing on one complete set of TA spacecraft equipment as a general rule at the Assembly level. All equipment must be made to pass these tests before it is considered acceptable for flight.

At the spacecraft system level the PTM tests shall be performed for qualification of the system design, analogous to the TA tests at Assembly level. The flight spacecraft system tests determine the flight acceptability of each spacecraft. It is the over-all responsibility of the Spacecraft System Manager to establish the criteria of acceptance for these two test programs.

A. GENERAL ENVIRONMENTAL SPECIFICATION

The Systems Division shall be responsible for establishing the general environmental requirements in the form of general specifications for type approval and flight acceptance testing. The divisions shall be expected to perform their testing in a manner that is consistent with the intent of these general environmental specifications and as is appropriate to each piece of hardware. For Mariner C, these specifications shall be Environmental Specification 30250B/30251B. This specification shall be under the ECR System by placement on the freeze list.

B. ENVIRONMENTAL TEST SPECIFICATIONS

See III-H-3-d.

¹ An "Assembly" is defined as the equipment configuration normally certified at SAF and normally carried as replaceable certified spares. See the Equipment List, III-F.

C. ENVIRONMENTAL TEST REPORTS

For each serial number of each equipment group subjected to Environmental TA and FA Tests, a test report is to be made on a Test Results Summary Form.

Test Results Summary Forms shall be prepared by the Environmental Requirements Project Representative in conjunction with the divisions to cover Environmental FA and TA testing. The Summary Form is intended to keep a single and accurate record of the tests performed. The summary form is to be completed by the hardware supplying division and supplied to the Environmental Requirements Project Representative immediately upon the passing of the tests. Included in the Test Results Summary Form will be the following items:

- (1) Tests covered and completion dates. Reference Environmental Test Specification Numbers.
- (2) Signature of the cognizant engineer or person supporting test from the division and signature of the Q. A. representative monitoring the test, if such exists.
- (3) Environmental Lab's test report form number (a copy of the test report is to be submitted if testing is done off the Laboratory).
- (4) List of all applicable failure reports.
- (5) Serial numbers, reference designations and accumulated operating time.

The Environmental Requirements Group shall be required to collect and appraise these reports, monitor the testing progress and to prepare for submission to the Spacecraft System Manager a Project Test Results Manual based on this information.

Contractors performing FA or TA testing must naturally comply with environmental test reporting.

Test Report Summary Forms shall be available as inputs to the appropriate review boards.

D. ENVIRONMENTAL TYPE APPROVAL AND LIFE TESTING

Per the above Environmental Test Specifications, Environmental TA tests are to be conducted on a complete set of spacecraft equipment, over and above other design qualification tests the divisions may establish. After passing Environmental TA tests, the TA equipment shall be subjected to life-testing in an environment as equivalent to cruise environment as possible.

TA equipment should pass TA test prior to completion date shown on attached schedule.

E. ENVIRONMENTAL FLIGHT ACCEPTANCE TESTING

Per the above Environmental Test Specification, Environmental FA Tests are to be conducted on all PTM, flight, and spare spacecraft equipment over and above other acceptance tests the divisions may establish.

Such equipment is to pass FA tests prior to delivery to SAF.

F. SUBSYSTEM COMPATIBILITY TESTS

Compatibility tests design to demonstrate gross interface compatibility between subsystems, groups of subsystems, and OSE must be performed for all critical subsystem interfaces. The specific tests to be performed shall be recommended by the Spacecraft Project Engineer. The tests must be performed prior to delivery of PTM hardware to SAF and may be supported with bread-board prototype, TA or PTM hardware.

G. MAGNETIC CONTROL TESTS

With the assistance of the Division 32 Project Representative, the Environmental Requirements Project Representative shall prepare a magnetic control specification.

All TA, PTM, and flight and spare spacecraft equipment is to be examined for its magnetic quality against this specification at the facility provided and manned by Division 32, to ensure to the greatest possible extent meaningful magnetometer measurements.

SECTION VI

SPACECRAFT SYSTEM TEST AND OPERATIONS REQUIREMENTS

A. PROCEDURES AND CHECK SHEETS

Subsystem procedures shall be submitted to Section 314 Operations supervisor, by each division participating in spacecraft checkouts, prior to delivery of PTM equipment to SAF.

Thereafter revision of these documents shall be according to Section 314 requirements with the concurrence of the cognizant subsystem personnel.

Detailed over-all spacecraft and OSE operational procedures and instructions, including system checkout, environmental and compatibility testing, and storage and shipping requirements and procedures shall be prepared by System Test and Operation Section 314.

B. EQUIPMENT STATUS REPORTS

Section 314, with the assistance of Q.A. shall issue weekly status reports to the Project and Spacecraft System Managers starting with the first delivery requirements to SAF.

These status reports shall indicate deficiencies in equipment deliveries, or lack of equipment due to ECR or repair action.

C. PROOF TEST MODEL (PTM) QUALIFICATION AND LIFE TESTING

All equipment supplied for the PTM is to be flight equivalent as of delivery and is to have passed Environmental FA test, etc. The PTM is to be subjected to a series of design verification tests and a set of environmental tests to qualify the design. As an objective, the performance of subsystems when operated at the extremes of environmental and parameter tolerances shall be evaluated. The Spacecraft System Manager is to assure the establishment

of criteria for qualification of the spacecraft design in a PTM Qualification Test Specification for the Mariner C spacecraft. Upon passing of the qualification tests per attached schedule, the PTM is to be subjected to spacecraft system life-testing for a considerable length of time to be specified later. A Test Report shall be prepared at both the conclusion of the qualification tests and at the conclusion of the Life Test.

PTM equipment and spares in particular are to be maintained in such a condition that they could be used temporarily to support a flight spacecraft test operation, for example, when a flight assembly is out for rework.

D. FLIGHT QUALIFICATION TESTS OF SPACECRAFT

Each complete spacecraft, including solar panels, shall be readied for flight by passing a series of flight qualification tests including a set of environmental tests. The Spacecraft System Manager is to assure the establishment of criteria qualification of these articles for flight in a Spacecraft Flight - Qualification Test Specification.

A Test Report shall be prepared at the successful conclusion of the flight qualification tests which must occur prior to shipment to the range.

E. SPACECRAFT OPERATIONS

Spacecraft operations, as used here, include all spacecraft system activities starting with the spacecraft and OSE assembly at SAF and ending with spacecraft launching. During this period access to the spacecraft shall at all times be under the responsibility of the Test Director, Quality Assurance shall provide surveillance for this activity.

Conduct of all Spacecraft Operations shall be the responsibility of Section 314, with assistance from all participating divisions.

All hardware contributing divisions shall be required to support spacecraft operations involving the system testing of the PTM and Flight Spacecraft in terms of hardware, documentation and procedures, and operations and technical support personnel. This support will consist of operators plus a minimum of one full time JPL cognizant engineer for each division present during spacecraft operations. It should be noted that this project will require four complete teams of operators - See schedule. The System Division shall be responsible and given the authority for the coordination, planning, and direction of all such activities.

The following spacecraft tests shall be conducted at the Laboratory:

- (1) Subsystem Tests
- (2) OSE Calibration Tests
- (3) Systems Tests
- (4) Dummy Run Countdown
- (5) Spacecraft Environmental Tests
- (6) PTM - Failure Mode and Marginal Parameter Tests
- (7) Joint Closed Loop Operations Tests (J-CLOT)
- (8) Match-mate Tests
- (9) Foreign Particle Tests
- (10) Magnetic Field and Radiation Control Tests

The following types of tests shall be conducted at AMR:

- (1) Magnetic Field Tests
- (2) OSE Calibration Tests
- (3) System Tests
- (4) Joint Flight Acceptance Composite Test (J-FACT)
- (5) Combined R.F. Interference Test
- (6) Precountdown
- (7) Operational Checkout at Explosive Safe Area

The Systems Division shall be responsible for establishing, maintaining, and implementing the following documentation, the first issue and subsequent major revisions to be approved, where required, as noted:

- (1) An Assembly and Operations Plan (AOP) - prepared by System Test and Operations Section 314, and approved by the Spacecraft System Manager.
- (2) Appropriate documentation, recording and reporting systems covering all activities including a spacecraft log and failure reporting - prepared by System Test and Operation Section 314.
- (3) Field Instructions Memorandum (FIM) - prepared by System Test and Operations Section 314, approved by Spacecraft System Manager
- (4) Field Operations Memo (FOM) - prepared by Section 314.
- (5) Criteria for shipment to AMR - prepared by Section 314, approved by Spacecraft System Manager.
- (6) The Project Manager shall, at launch, hold the following persons accountable for reporting accurately the state of readiness for these equipment areas to launch:
 - (a) Spacecraft System Manager - Spacecraft Readiness
 - (b) Launch Vehicle System Manager - Launch Vehicle Readiness
 - (c) Space Flight Test Director - SFOF/DSIF
 - (d) Section 314 - AMR Operations Center Coordinator

F. SPACE FLIGHT OPERATIONS

Space flight operations are described as those activities necessary from launch of the spacecraft to completion of the mission. The objectives are obtaining and processing of spacecraft information and commands and evaluation of each flight. The tracking, communication, data processing, and computing facilities required in support of these activities become an integral part of these operations.

Each technical division must have the capability to supply technical representatives for each of their subsystems on a 24 hour basis throughout the entire space flight operations phase of the project.

The following documents are requirements for the successful integration of the operations:

- (1) A Space Flight Operation Plan (SFOP) - prepared by Space Flight Test Director, approved by Project Manager.
- (2) A J-CLOT Plan - prepared by Space Flight Operation Section 316, approved by Space Flight Test Director
- (3) Space Flight Operations Memo (SFOM) - prepared by Space Flight Test Director, approved by Project Manager.
- (4) An SFO Capabilities and Procedures (CAP).

The following documents relate to the DSIF activities:

- (1) Tracking Instruction Memo (TIM) - prepared by Communication Engineering - Operations Section 332, for approval by Deputy Director of DSIF.
- (2) Tracking Operations Memo (TOM) - prepared by Communication Engineering - Operations Section 332, for approval by Deputy Director of the DSIF.

G. OPERATIONS INTERFACE DOCUMENTS

To assure coordination between the various agencies involved in a mission, the following documents are required:

- (1) LMSC/LeRC/JPL Interface Plan of Operation - Section 311 input.
- (2) Operation Program Estimate (OPE) - prepared by System Test and Operations Section 314, for JPL inputs.
- (3) Program Requirements Document (PRD) - prepared by System Test and Operations Section 314.

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- (4) Preliminary Countdown Manual (PCM) - prepared by LMSC with Division 31 supporting.
 - (5) Range Safety Report (RSR) - prepared by LMSC with Division 31.
 - (6) Pad Safety Report (PSR) - prepared by System Test and Operations Section 314.
 - (7) Flight Termination Report - prepared by LMSC with Division 31 inputs.

H. SPARES AND REPLACEMENT

Upon failure of a component in PTM, spares, flight equipment or OSE, (once deliveries have been made to SAF), the cognizant divisions shall make every effort to take the corrective action necessary and reestablish the full complement of equipment at SAF as quickly as possible.

Equipment redelivered to SAF must be recertified. It is the decision of the cognizant Section Chief as to the extent of requalification of the equipment for flight acceptance.

SECTION VII

PROCUREMENT REQUIREMENTS

A. PROCUREMENT INITIATION

The policies and requirements stated herein are required to extend to and apply to the equipment and services supplied to the project by off-Laboratory suppliers be they subcontractors or experimenters. Hardware will be subject to the same requirements for delivery to SAF as JPL produced equipment. All new contracts shall follow the procedures outlined in this EPD. All contracts already underway will be reviewed and amended where possible to be consistent with this EPD.

For each contract initiated by the divisions to purchase services and/or equipment for the Mariner C Project, a Procurement Requisition and a Statement of Work must be completed. The formal Statement of Work will be prepared by Division 62 in support of the initiating division and approved by the cognizant section on the basis of the following minimum check list.

The Statement of Work shall include the following:

- (1) Schedule Requirements, over-all and detailed.
- (2) Quantities and types required.
- (3) Breakdown of cases into areas or phases where applicable.
- (4) List of applicable drawings.
- (5) Applicable control drawings.
- (6) Drawing control requirements per JPL Specification 20030A.
- (7) If design is to be done by contractor:
 - (a) JPL is to supply Design Specification and other applicable specifications and drawings (all of which may have been prepared on contract).

- (b) JPL is to furnish reliability, Q. A., and test requirements. The Q. A. Specification and Drawing List for inspection is to be provided.
 - (c) Contractor is required to prepare a complete set of detail drawings and detail specifications adequate for performing fabrication.
 - (d) Contractor is to supply updated list of detail drawings and detail specifications at least once a month.
 - (e) State requirements for preparation of Environmental TA and FA test specifications to permit JPL review, if such is desired of contractor.
 - (f) Contractor must not make changes in violation of ECR system.
- (8) If fabrication is to be done by contractor:
- (a) Contractor is to be supplied with complete set of Detail Drawings, Control Drawings, and Detail Specifications and other applicable specifications (all of which may have been prepared on contract).
 - (b) Contractor is to supply updated list of detail drawings and specifications at least once a month.
 - (c) Provisions for Q. A., reliability and test requirements must be included in Statement of Work. Per Specification 30274.
 - (d) Contractor must be required to conform to controlled-parts requirements.
 - (e) Contractor must comply with JPL failure reporting system.
 - (f) Contractor must not make changes in violation of ECR system.
- (9) If Environmental TA/FA testing is to be done by contractor:
- (a) Contractor must be provided JPL-approved Environmental TA/FA test specification (all of which may have been prepared on contract).
 - (b) Contractor must conform to Q. A. monitoring.
 - (c) Contractor must comply with failure reporting system.

- (d) Contractor must perform replacements only with controlled-parts.
- (e) Contractor must prepare Test Reports.
- (f) Contractor must not make changes in violation of ECR system.
- (g) Contractor must own or have access to adequate test facilities.
Division 37 shall be permitted to review this adequacy and make reports to Spacecraft System Manager and the cognizant Division.
- (10) In all cases the Statement of Work is to state the procedure by which contractor shall report technical progress.
- (11) Indicate all equipment and parts to be furnished by JPL.
- (12) Shipping of all spacecraft hardware shall be in conformance with JPL Specification 20064A.

B. PROCUREMENT INSTRUCTIONS

For the purpose of preventing delays due to misunderstandings the Division 62 Project Representative shall provide in quantity to each division a set of instructions on the initiation of procurement action and procurement processes. These instructions should be presented in a clear and simple fashion and include a procurement cycle diagram. The responsibilities of the initiating Division and Division 62 should be clearly stated.

C. EXPERIMENTER CONTRACTS

JPL shall place all approved (nongovernment) experimenters on contract. For experimenters supplying no hardware, a limited Statement of Work which is common to all shall be initiated by Division 32. In the case of government experimenters the same Statement of Work shall be by agreement with their Center Directors.

For Experimenters who supply hardware, their Statement of Work shall include the limited one above, and all of the requirements of a subcontractor stated in VII A.

The limited statement of work shall cover the time from approval of the experimenters by NASA Headquarters to termination of the mission (about one month after encounter) plus five months.

The Statement of Work shall provide for:

- (1) Costs for attending meetings called by members of the Mariner C Project for Mariner C Project purposes only.
- (2) Costs for the Experimenter in correlating and interpreting flight data with statements as to where, how, and by whom this shall be done.
- (3) Requirements for the Experimenter to submit to JPL bimonthly reports of his analysis throughout the period of the contract. JPL will ensure that such information is not released to the public except by the clear approval of the Experimenters submitting the report. A final report shall be submitted at conclusion of contract.
- (4) Release of information to the public through the Project Office for NASA approval.
- (5) At a mutually agreed upon time, information will be placed in the Public Domain.

SECTION VIII

PERSONNEL REQUIREMENTS

A. DIVISION REPRESENTATIVES

Division Project Representatives shall be supplied by Division 31, 32, 33, 34, 35, 37, 38, 62, and DSIF. The description of his responsibilities are as follows:

- (1) Each of the technical divisions and the Procurement Division shall appoint at least one divisional Project Representative for the Mariner C Project. If more than one representative is appointed, their respective areas of responsibility shall be clearly defined. The divisional Project Representatives shall be senior, experienced individuals and shall be full time on one project. The divisional representatives shall be appointed at or prior to the time that the system design is first formulated (functional specifications prepared) and the appointments shall be subject to the approval of the Project Manager.
- (2) The divisional Project Representative is responsible for:
 - (a) Being thoroughly familiar with the general aspects of his division's over-all plans for implementing their assigned part of the project requirements.
 - (b) Having rapid and direct access to all developed details of these plans.
 - (c) Being prepared to report on short notice of the state of development, and the specifics of these plans.
 - (d) Having a mechanism for understanding and accurately evaluating the status of the divisional activities on the project.
 - (e) Being prepared to report at specified occasions on the status of all divisional activities as compared to the plans.

- (f) Reporting any actual or potential problems to appropriate project personnel in a timely fashion.
 - (g) Handling in an expeditious fashion all day-to-day project affairs that are within the scope of the established plans.
 - (h) Taking the initiative in promptly bringing together project personnel and the appropriate management personnel from his division at any time that the over-all plans should be reviewed or modified.
 - (i) Keeping the line management personnel in his division adequately informed of all aspects of the project to which he is assigned that are important to their properly carrying out their line responsibilities.
 - (j) Acting as a redundant check to ensure that his division's technical and scheduling interfaces are being met.
- (3) Authorities. The division Project Representative has sufficient authority within his division to expeditiously conduct all project matters that are within the established divisional project plans. His degree of authority to modify these plans can be established by each division. However, the division is responsible for providing an understood and defined mechanism for expeditiously handling reviews and modifications of the established plans.
- (4) Relationship to Project Manager and Spacecraft System Manager. All statements of fact, evaluation of status, opinions and decisions officially stated by the Project Representative to the Project Manager and Spacecraft System Manager must be and will be regarded as officially coming from his division and representing their official position. The Project Manager and Spacecraft System Manager have the right to consult officially with any members of the division but should do so in the presence of the Division Representative, if he so wishes. The Division Representative should, in response to specific direction or request from the Project Manager or Spacecraft System Manager, state directly whether he has the authority to proceed or must get the concurrence of line personnel in his division.

- (5) Relationship to Division Line Management Personnel. The Division Project Representative must be provided a clear understanding as to his relationships and authorities relative to the line management. He must at least be provided with direct and adequate communication channels to see that all project matters are properly understood and are expeditiously handled. To handle the volume of activity associated with Project Requirements, Q.A. requirements, procurement, and all the aforementioned functions, each division must consider the degree of assistance to be provided to the Project Representative.

B. SPACECRAFT SYSTEM MANAGER

1. Applicability

A Spacecraft System Manager shall be appointed for each spacecraft project officially undertaken in-house by the Laboratory.

2. Organizational Location

The Spacecraft System Manager shall be administratively assigned to, and shall report to, the Chief of the Systems Division.

3. Responsibilities

The Spacecraft System Manager shall be responsible for:

- (a) The quality and adequacy of the systems design of the spacecraft and its associated operational support equipment.
- (b) The analytical performance and reliability evaluation of the systems design.
- (c) The development of a complete systems testing plan for both test and flight spacecraft.
- (d) The conduct and evaluation of these systems tests.

- (e) The continuing maintenance of detailed schedules for the spacecraft and its associated ground support equipment that are compatible with the project requirements.
- (f) The continuing maintenance of a reliability appraisal of the spacecraft based upon analysis, test, and failure experience.
- (g) The recognition and resolution of all the interface factors between the spacecraft and its ground support equipment and the other systems of the project that directly effect the reliability or performance of the spacecraft.
- (h) Controlling the total spacecraft design within established design control procedures.
- (i) The committing to launch of the flight spacecraft.
- (j) The providing of consulting services to the Project Manager regarding the spacecraft behavior during flight.

4. Authority

Within the mission objectives, design criteria, and other project guidelines established by the Project Manager, and within policies, procedures, and manpower and dollar resources assigned by the Chief of the Systems Division, the Spacecraft System Manager shall have full authority within the System Division to carry out the above-listed responsibilities for his assigned spacecraft and its associated OSE. He also has full authority over the systems design of the spacecraft and its associated OSE. Other specific authorities will be assigned in other appropriate documents.

5. Relationship to Project Manager

The Spacecraft System Manager's day-to-day directions on all matters relating to the project will come from the Project Manager. In addition to the above specific responsibilities, the Spacecraft System Manager shall advise the Project Manager on any and all matters concerning the spacecraft and its GSE at either party's initiative. Specifically, the Spacecraft System Manager should

immediately advise the Project Manager of any problem or potential problem that he (the Spacecraft System Manager) believes exists but is beyond his authority to control.

6. Relationship to the Chief of Systems Division

The Chief of the Systems Division establishes the organization policies and procedures of the Systems Division and, after agreement with the Project Manager, allocates the manpower and assigned money's. These factors in general do not change rapidly, and the Spacecraft System Manager is expected to understand and work within them. The Spacecraft System Manager is expected to keep the Chief of the Systems Division generally informed of his activities and to recommend alteration in these policies, practices, or resource allocations whenever he feels such alterations would be of benefit to either his assigned spacecraft or the Systems Division Operations.

7. Relationship to the Technical Divisions Responsible for Supplying Spacecraft Equipment

The Spacecraft System Manager shall be provided complete and rapid access to all information pertinent to the spacecraft and its OSE. In conducting the spacecraft system design and evaluation, the Systems Division (and Spacecraft System Manager) should work with the variational characteristics of the subsystems as supplied by the responsible divisions after once ensuring that an adequate understanding exists as to the applicability and nature of these characteristics. The technical divisions are responsible for delivering to SAF certified, flight ready spacecraft equipment meeting the characteristics defined by the systems design and by the date established on the official schedules. The Spacecraft System Manager does have authority over the spacecraft system design and subsystem interfaces and therefore has the authority to modify the system design and subsystem interfaces and, the necessary affected characteristics of the subsystem provided no project-established requirements are violated. In cases of reasonable doubt as to whether or not a particular issue involves a system design or interface matter, the decision of the Spacecraft System Manager should apply unless the responsible division immediately

appeals to the Project Manager. The Spacecraft System Manager shall control the design of the spacecraft utilizing and within the ECR system. When spacecraft flight equipment and its associated OSE are first delivered to SAF, they come under the jurisdiction and authority of the Spacecraft System Manager as to its utilization.

C. SYSTEMS DIVISION REPRESENTATIVES

The Systems Division shall assign the following full-time representatives to the Mariner C Project and in their respective areas they shall conform to the responsibilities described in VIII A.

*1. Spacecraft Project Engineer

The Spacecraft Project Engineer is responsible for the design of the spacecraft and his duties and authorities are outlined throughout this document.

2. Program Engineer

The Program Engineer is responsible for the following:

- (a) Coordinate a Systems Division position on Project-wide matters.
- (b) Conduct the biweekly Project-Oriented meeting for the Project Manager.
- (c) Conduct the biweekly Spacecraft-Oriented meeting for the Spacecraft System Manager.
- (d) Conduct special Project-wide status meeting for the Project Manager.
- (e) Verify for the Project and Spacecraft System Managers that methods have been established for actions as called out in this document and that action is proceeding at all times, particularly where those actions have been assigned to the Systems Division.
- (f) Collect and advise improvements in Policy and Requirements Document.

- *3. Operations Supervisor
- *4. Environmental Requirements Manager
- *5. OSE/Design Evaluation Engineer
- 6. SFO Test Director
- 7. Section 312 Representative
- 8. Launch Vehicle Representative
- 9. Launch Constraints Representative

D. Q. A. ORGANIZATION REPRESENTATIVE

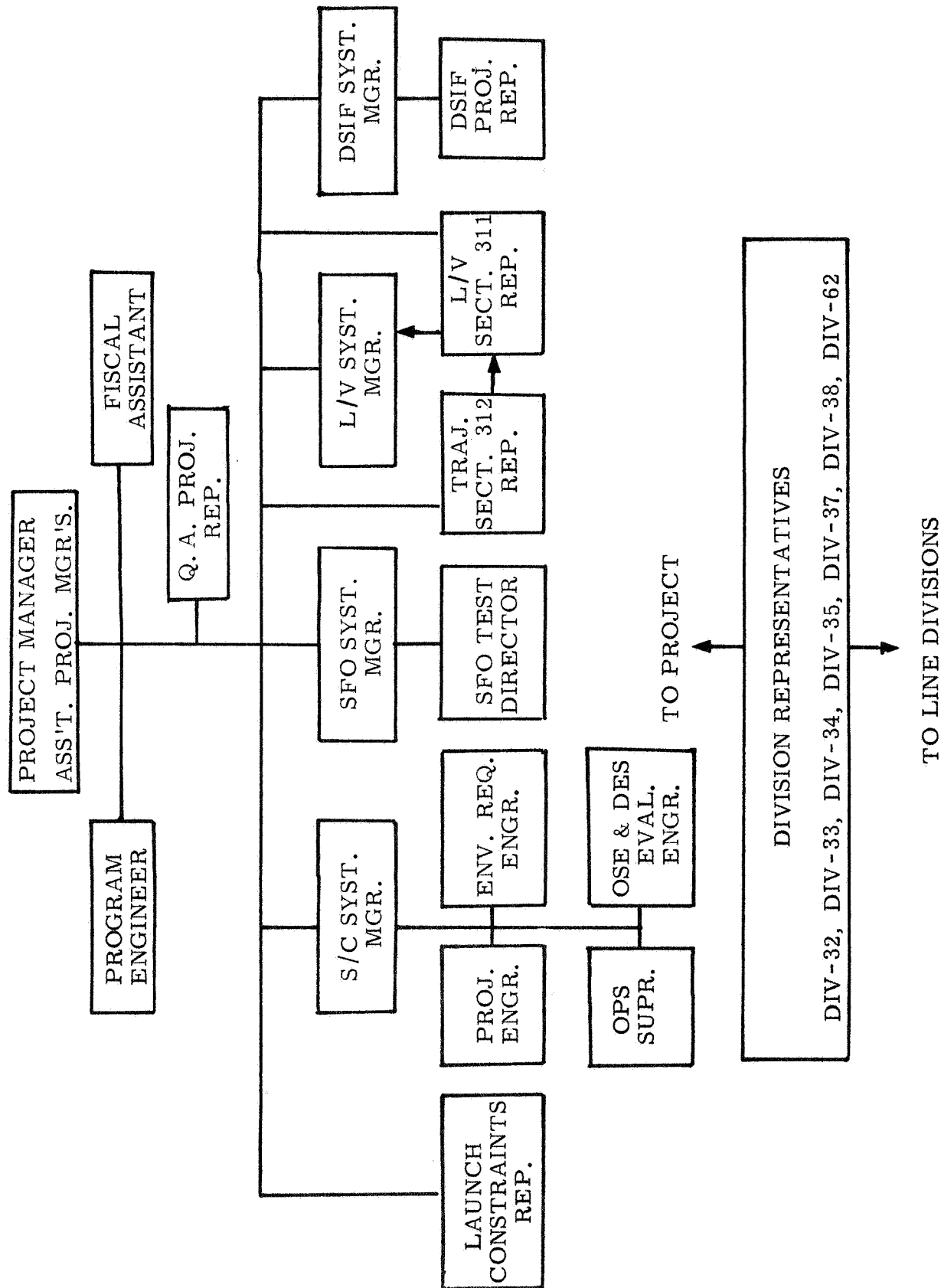
A full time representative shall be assigned to the Mariner C Project with duties as outlined throughout this document and appropriate Q. A. manuals.

E. PROCUREMENT REPRESENTATIVE

A full time Division 62 Representative shall be appointed whose duties are defined in Section VIII-B.

*All of these representatives primarily provide support to the Spacecraft System Manager.

G. PROJECT COORDINATION ORGANIZATION



SECTION IX

SCHEDULING REQUIREMENTS

A. PROJECT SCHEDULES

Project schedules shall be prepared and approved as shown on the following schedule list. Those indicated for maintenance of schedules are required to make progress reports at biweekly meetings.

These schedules are milestone schedules and certain milestones shall be designated on each schedule for reporting to NASA Headquarters.

B. SPACECRAFT EQUIPMENT FLOW PLANS

In order to carry out the development, fabrication, and delivery of the subsystem hardware, each Division, through its Division Representative, shall be required to prepare and monitor Equipment Flow Plans. These plans shall be integrated by the Program Engineering Section 315 into a spacecraft system PERT network, as described in Section IX-C of this document, in order to demonstrate to the Spacecraft System Manager that interdivisional interfaces are compatible, and to provide him with a composite report for planning, evaluation, and control of the spacecraft system.

A spacecraft Equipment Flow Plan is defined as a PERT-type display which integrates the events and activities illustrating the logical informational and schedule relationships in completing the design, development, fabrication, test, and delivery of spacecraft hardware. It indicates need dates for decisions, procedures, equipment, or facility availability, type approval tests, flight acceptance tests, and other related activities.

The Spacecraft Equipment Flow Plans shall be developed for all division spacecraft hardware delivered to SAF, and shall be prepared down to the level of detail, wherein each equipment portion is under one Division's cognizance.

SCHEDULE LIST - MARINER C PROJECT

SCHEDULE	APPROVED BY	MAINTAINED BY
I. Project Schedule	Project Mgr.	Asst. Project Mgr.
II. Project Schedules for Regular Reporting		
Spacecraft Schedule	S/C Syst. Mgr.	Coord. Prog. Engr.
OSE Design and Preparation Schedule	S/C Syst. Mgr.	OSE Proj. Rep.
Design Evaluation - SAF Assy and Ops	S/C Syst. Mgr.	OPS Rep.
P-70/71/72 Mission - SAF Assy and Ops	S/C Syst. Mgr.	OPS Rep.
P-70/71/72 Mission - AMR Ops*	S/C Syst. Mgr.	OPS Rep.
AMR Facilities	Sec. Chief - 314	OPS Rep.
Launch Vehicle Schedule*	Sec. Chief - 311	L.V. Proj. Rep.
Launch Pad Preparation and Utilization*	Sec. Chief - 311	L.V. Proj. Rep.
Project Interface Documentation*	Sec. Chief - 311	L.V. Proj. Rep.
Trajectory, AMR Instr., & Range Support	Sec. Chief - 312	Traj., AMR Support Rep.
DSIF Mod and Preparation	DSIF Syst. Mgr.	DSIF Proj. Rep.
Space Flight Operations Plan	SFO Syst. Mgr.	SFO Test Director
Major Contracts Schedule	Sec. Chief - 622	Procurement Proj. Rep.
III. Detailed Working Schedules		
LV/SC Integration*	Sec. Chief - 311	L.V. Proj. Rep.
Division 32, 33, 34, 35, 38 Flow Charts	S/C Syst. Mgrs.	Division Reps.

* In response to the JPL prepared project-version of these schedules, a version of each of these schedules is to be prepared by LMSC for LeRC. By negotiation the two versions are to be made compatible.

NOTE: All the above schedules will be coordinated by the Program Engineer. In this coordination, a common format will be maintained, status will be monitored, frequent issues will be made and the schedules will be examined for interconsistency by PERT techniques. The schedules will be subject to review at all times by the Project Office.

By indicating need dates for decisions, equipment or facility availability, etc., (representing interface points between Sections or Divisions) the flow plan provides a convenient device for identifying the necessary agreements with the affected Section or Divisions. Once an agreement has been reached it is required that the flow plan be initialed or signed by the individual responsible for the Section's or Division's commitment. With the Division Project Representative structure the Project Representative for the affected divisions will in most cases be the appropriate signature.

Flow plans to be prepared by each division will be determined by the Spacecraft System Manager on the basis of the Equipment List (III-F). Each of these plans should show as an end event, certification at SAF. It is required that there be such an event for each group of equipment assembled together for delivery to SAF.

Flow plans shall include at least the information shown below:

- (1) In all areas, with certain obvious exceptions, show each serial number of equipment such as TA, spacecraft units 1, 2, 3, etc.
- (2) The expected start and finish date of environmental flight acceptance testing and type approval testing. Indicate if the testing is to be performed at JPL or at a vendor.
- (3) Indicate time periods during fabrication and testing when inprocess inspection is planned. Show whether the inspection is to take place at JPL or at a contractor. If inspection is to occur at a contractor, this information may be carried separately on Q. A. flow plans prepared by the contractor.
- (4) Indicate when all special equipments are required and who is to supply these. For example, during flight acceptance testing are heater pans required? Heaters? Dummy weights? Special harnesses?
- (5) Indicate the point in time where flight case harnesses and cases are required to meet the flight equipment.

- (6) Indicate the date of the start of contract action and the date by which all procurements for the individual equipment must have contractual go-ahead.
- (7) Indicate the date by which the equipment fabrication must be complete.
- (8) Show delivery of equipment to JPL.
- (9) Show performance testing other than FA/TA tests where appropriate.
- (10) Show delivery to SAF.
- (11) Show certification at SAF.
- (12) Show where test specifications (TA/FA) are required in order to proceed with testing.
- (13) If specific GSE or special test equipment is required, indicate the activity requiring the equipment and the need time.
- (14) Show intersubsystem compatibility tests.
- (15) Show compatibility tests with GSE.
- (16) Any key interdivisional commitments or agreements mutually desired by the involved divisions.

The maintenance of all plans as representative of the true situation and the biweekly reporting to the Spacecraft System Manager of the Division's performance in relation to its flow plan shall be a project requirement.

C. PROJECT EVALUATION AND REVIEW

The Project Manager and the Director's Management Information Staff shall review the Project Schedules defined in IX-A and the Spacecraft Equipment Flow Plans defined in IX-B to:

- (1) Select the most significant events and activities to be included in the Project Master Plan submitted to NASA Headquarters.
- (2) Establish the PERT Network to be used in regular, recurring Project reporting to NASA Headquarters.

The Directors Management Information Staff shall as a result of preparing PERT Networks on the Project Schedules and equipment flow plans, advise the Project Manager of any areas of concern such as lack of critical events scheduled or inadequate time scheduled for certain activities.

The Information Staff shall receive all project schedule and status information. To get weekly reports on status, an Information Staff representative shall attend the Project and Spacecrafts Meetings.

SECTION X

MEETING REQUIREMENTS

A. WEEKLY MEETINGS

A Project Oriented meeting will be held on the alternate weeks of a Spacecraft Oriented meeting.

1.. Project Meeting Attendance Required

- (a) Project Manager or Assistant Project Manager
- (b) Spacecraft System Manager
- (c) Program Engineer
- (d) SFO Test Director
- (e) OPS Supervisor
- (f) Section 312 Representative
- (g) Launch Vehicle Representative
- (h) Launch Constraints Representative
- (i) DSIF Representative
- (j) Technical Division Representatives - Attendance Desired

2. Spacecraft Meeting Attendance Required

- (a) Project Manager or Assistant Project Manager
- (b) Spacecraft System Manager
- (c) Program Engineer
- (d) Spacecraft Project Engineer
- (e) OSE/Design Evaluation Representative
- (f) Environmental Requirements Representative

- (g) Operation Supervisor
- (h) Q. A. Project Representative
- (i) Division 32 Representative
- (j) Division 33 Representative
- (k) Division 34 Representative
- (l) Division 35 Representative
- (m) Division 37 Representative
- (n) Division 38 Representative
- (o) Division 62 Representative

